

Attorney Docket No.: 02SPE118P-DIV

In the Claims:**Claims 1-92 (canceled).**

Claim 93 (currently amended): A method of manufacturing an interconnect, said method comprising steps of:

forming a first patterned layer of conductive material, said first patterned layer having a trench situated between a first and a second interconnect line;

depositing a first insulating layer over said first patterned layer, said first insulating layer filling said trench;

depositing a first hard mask on said first insulating layer;

forming a first air gap, a second air gap, and a support pillar in said first hard mask and said first insulating layer, said support pillar being situated between said first air gap and said second air gap, said support pillar, said first air gap, and said second air gap being situated in said trench in a direction parallel to a length of said first interconnect line, said support pillar being in contact with said first interconnect line;

depositing a sealing layer over said first hard mask to seal said first air gap and said second air gap;

wherein said support pillar is formed to increase mechanical strength and thermal conductivity of said first interconnect line, wherein said first insulating layer and said sealing layer comprise a same low dielectric constant material.

Claim 94 (previously presented): The method of claim 93 wherein said step of forming a first air gap and a second air gap includes steps of:

applying a photoresist material to said first hard mask, said photoresist material defining an air gap pattern;

etching said first air gap and said second air gap in said first hard mask and said first insulating layer based on said air gap pattern.

Claim 95 (previously presented): The method of claim 93 further comprising a step of opening a via hole in said sealing layer, said first hard mask, and said first insulating layer.

Claim 96 (previously presented): The method of claim 95 wherein said step of opening a via hole in said sealing layer, said first hard mask, and said first insulating layer includes steps of:

applying a photoresist material to said sealing layer, said photoresist material defining a via hole pattern;

etching a via hole in said sealing layer, said first hard mask, and said first insulating layer based on said via hole pattern.

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Claim 97 (previously presented): The method of claim 95 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said sealing layer.

Claim 98 (previously presented): The method of claim 93 further comprising steps of:

depositing a second insulating layer over said sealing layer;

forming a via hole through said second insulating layer, said sealing layer, said first hard mask, and said first insulating layer.

Claim 99 (previously presented): The method of claim 98 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said sealing layer.

Claim 100 (previously presented): The method of claim 93 further comprising steps of:

depositing a second insulating layer over said sealing layer;

depositing a second hard mask over said second insulating layer;

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forming a via hole through said second hard mask, said second insulating layer, said sealing layer, said first hard mask, and said first insulating layer.

Claim 101 (previously presented): The method of claim 100 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said second hard mask.

Claims 102-103 (canceled).

Claim 104 (previously presented): The method of claim 93 wherein said first patterned layer of conductive material comprises material selected from the group consisting of polysilicon, titanium, titanium nitride, tantalum, tantalum nitride, tungsten, copper, aluminum, and aluminum alloy.

Claim 105 (currently amended): A method of manufacturing an interconnect, said method comprising steps of:

forming a first patterned layer of conductive material, said first patterned layer having a trench situated between a first and a second interconnect line;

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depositing a first insulating layer over said first patterned layer, said first insulating layer filling said trench;

depositing a second insulating layer over said first insulating layer;

depositing a first hard mask on said second insulating layer;

forming a first air gap, a second air gap, and a support pillar in said first hard mask, said second insulating layer, and said first insulating layer, said support pillar being situated between said first air gap and said second air gap, said support pillar, said first air gap, and said second air gap being situated in said trench in a direction parallel to a length of said first interconnect line, said support pillar being in contact with said first interconnect line;

depositing a sealing layer over said first hard mask to seal said first air gap and said second air gap;

wherein said support pillar is formed to increase mechanical strength and thermal conductivity of said first interconnect line, wherein said first insulating layer and said sealing layer comprise a same low dielectric constant material.

Claim 106 (previously presented): The method of claim 105 wherein said step of forming a first air gap and a second air gap includes steps of:

applying a photoresist material to said first hard mask, said photoresist material defining an air gap pattern;

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etching said first air gap and said second air gap in said first hard mask, said second insulating layer, and said first insulating layer based on said air gap pattern.

Claim 107 (previously presented): The method of claim 105 further comprising a step of opening a via hole in said sealing layer, said first hard mask, said second insulating layer, and said first insulating layer.

Claim 108 (previously presented): The method of claim 107 wherein said step of opening a via hole in said sealing layer, said first hard mask, said second insulating layer, and said first insulating layer includes steps of:

applying a photoresist material to said sealing layer, said photoresist material defining a via hole pattern;

etching a via hole in said sealing layer, said first hard mask, said second insulating layer, and said first insulating layer based on said via hole pattern.

Claim 109 (previously presented): The method of claim 107 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said sealing layer.

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Claim 110 (previously presented): The method of claim 105 further comprising steps of:

depositing a third insulating layer over said sealing layer;

forming a via hole through said third insulating layer, said sealing layer, said first hard mask, said second insulating layer, and said first insulating layer.

Claim 111 (previously presented): The method of claim 110 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said sealing layer.

Claim 112 (previously presented): The method of claim 105 further comprising steps of:

depositing a third insulating layer over said sealing layer;

depositing a second hard mask over said third insulating layer;

forming a via hole through said second hard mask, said third insulating layer, said sealing layer, said first hard mask, said second insulating layer, and said first insulating layer.

Claim 113 (previously presented): The method of claim 112 further comprising steps of:

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forming a conductive plug in said via hole;
forming a second patterned layer of conductive material over said second hard mask.

Claims 114-115 (canceled).

Claim 116 (previously presented): The method of claim 105 wherein said second insulating material comprises silicon dioxide.

Claim 117 (previously presented): The method of claim 105 wherein said first patterned layer of conductive material comprises material selected from the group consisting of polysilicon, titanium, titanium nitride, tantalum, tantalum nitride, tungsten, copper, aluminum, and aluminum alloy.

Claim 118 (new): A method of manufacturing an interconnect, said method comprising steps of:

forming a first patterned layer of conductive material, said first patterned layer having a trench situated between a first and a second interconnect line;
depositing a first insulating layer over said first patterned layer, said first insulating layer filling said trench;
depositing a first hard mask on said first insulating layer;

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forming a first air gap, a second air gap, and a support pillar in said first hard mask and said first insulating layer, said support pillar being situated between said first air gap and said second air gap, said support pillar, said first air gap, and said second air gap being situated in said trench in a direction parallel to a length of said first interconnect line, said support pillar being in contact with said first interconnect line;

depositing a sealing layer over said first hard mask to seal said first air gap and said second air gap;

depositing a second insulating layer over said sealing layer;

depositing a second hard mask over said second insulating layer;

forming a via hole through said second hard mask, said second insulating layer, said sealing layer, said first hard mask, and said first insulating layer;

wherein said support pillar is formed to increase mechanical strength and thermal conductivity of said first interconnect line, wherein said first insulating layer and said sealing layer comprise a low dielectric constant material.

Claim 119 (new): The method of claim 118 further comprising steps of:

forming a conductive plug in said via hole;

forming a second patterned layer of conductive material over said second hard mask.